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Identification and Significance of Innovation

Remote sensing science missions need reconfigurable thermal control systems to cool multiple instruments

A highly adaptable and reconfigurable two-phase pumped loop architecture with multiple evaporators and multiple radiators

- Unique mechanism to circulate two-phase flow exiting from radiators
- Stable cooling temperatures for a network of evaporators with variable heat loads
- Unique mechanism to enable reliable pumped loop start-up
- Actively controlled two-phase pressure at evaporator inlet to minimize cooling temperature drift
- Gravity-insensitive components

Benefits

- Compact, lightweight, and low power
- Spatially and temporally highly isothermal payloads

Estimated TRL at beginning and end of contract: (Begin: 3 End: 4)

Technical Objectives and Work Plan

Phase I Results:

- Successfully demonstrated core functionality of the two-phase pump loop architecture
- Developed design for gravity-insensitive pumped loop system

Technical Objectives:

- Stable and reliable system operation
- Spatially and temporally highly isothermal cooling temperature
- Energy efficient operation
- High reconfigurability

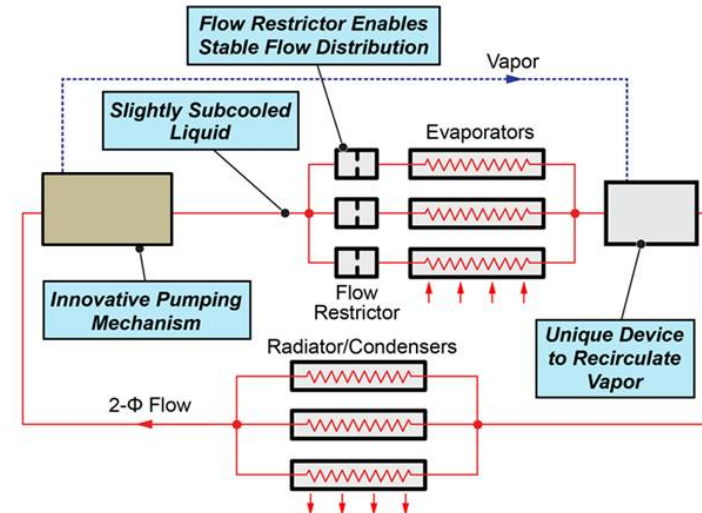
Phase II Work Plan:

Design, build, and assemble a two-phase pumped loop

- Design, fabricate, and test gravity-insensitive accumulator
- Build other gravity-insensitive components and assemble system

Optimize key loop operating parameters

Demonstrate operation and reconfigurability



NASA Applications

- Thermal control systems for future remote sensing science missions, including Surface Water and Ocean Topography (SWOT)
- Thermal control systems for advanced spacecraft with multiple instruments

Non-NASA Applications

- Two-phase thermal control systems in commercial and military satellites, aircraft, high altitude balloons, and vehicles
- Thermal management systems for high-power electronics systems

Firm Contacts

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